CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1 ·	 A system for welding, comprising:
2	a welding-type power source, wherein
3	the welding-type power source has at
4	least one control input, and
5	a welding-type output;
6	a feedback circuit,
7	responsive to the welding-type output,
8	and
9	having a feedback output; and
10	a controller having
1.1	a feedback input connected to the
L2	feedback output, having
L3	an eta control circuit responsive to the
L 4	feedback input,
L5 ·	an eta output, and
.6	at least one control loop having a
.7	selectable response time, a response time selector
.8	responsive to the eta output, and a control output
	connected to the control input.

2. The system of claim 1, wherein the control loop has at least two response times.

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3 4 3. The system of claim 2, wherein the control loop has a plurality of response times chosen from a range of response times, wherein the response time is responsive to eta.

1	4. The system of claim 2, wherein the welding-
2	type power source is an SCR based, phase controlled, power
3	source.
1 2	5. The system of Claim 1, wherein the controller is a microprocessor controller.
1 <u>.</u> 2	6. The system of claim 2, wherein the feedback circuit includes a voltage feedback circuit.
1	7. The system of claim 6, wherein the response
2	time selector includes an integrator responsive to an eta
3	window.
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1	8. The system of claim 6, wherein the at least
2	one control loop includes a voltage control loop and a
3	temporal control loop.
1	9. A method of providing welding power,
2	comprising:
3	providing a welding-type output;
4	feeding back an output parameter;
5	determining an eta of the output;
6 ·	controlling the welding-type output in
7	response to feeding back; and
8	setting a response time of the controlling in
9	response to eta.
1	10. The method of claim 9, wherein setting a
2	response time includes selecting one of at least two
3	response times.
1	11. The method of claim 10, wherein feeding back
2	includes feeding back of an output voltage.

3	12. The method of claim 9, wherein setting the
4	response time includes comparing eta to a window.
1	13. A system of providing welding power,
2	comprising:
3	means for providing a welding-type output;
4	means for feeding back an output parameter,
5	connected to the means for providing;
6	means for determining an eta of the output,
7	connected to the means for feeding back;
8	means for controlling the welding-type output
9	in response to the output parameter, connected to the
10	means for providing and the means for feeding back; and
11	means for setting a response time of the
12	means for controlling in response to eta, connected to the
13	means for controlling and the means for determining.
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1	14. The system of claim 13, wherein the means for
2	feeding back includes means for feeding back an output
3	voltage. ^
1	15. The system of claim 13, wherein the means for
2	setting the response time includes means for comparing eta
3	to a window, connected to the means for determining.
	Total determining.
1	16. A system for welding, comprising:
2	a welding-type power source, having
3	at least one control input, and
4	a welding-type output;
5	a feedback circuit, responsive to the
6	welding-type output, and having a feedback output;
7	a controller having
8	a feedback input connected to the feedback
9	output,

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11	a voltage control loop responsive to the
12	feedback input,
13	a temporal control loop responsive to the feedback input,
14	a control output, responsive to that
15	voltage control loop and the temporal control
16	loop, connected to the control input.
1	17. A system for welding, comprising:
2	power means for supplying welding-type power
3	in response to at least one control input;
4	feedback means for feeding back at least one
5	output parameter of the welding-type power, connected
6	to the power means;
7	control means for controlling the power means
8	in response to the a feedback means, connected to the
9	feedback means and the power means, wherein the control
10	means includes a voltage control loop and a temporal
11	control loop.
1	18. A method of providing welding power,
2	comprising:
3	providing a welding-type power output;
4	feeding back a parameter of the power output;
5	controlling the welding-type power in
6	response to the feeding back, using a voltage control
7	loop and a temporal control loop.
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1 2 ·	19. A welding-type power supply controller comprising:
3	at least one feedback input;
4	a voltage control loop, including
5	a voltage feedback input connected to
6	the feedback input, and

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7	an integrator having first and second
8	feedback capacitors, wherein
9	a switch, having a switch control input
10	is in series with the second capacitor; and
11	an eta controller having an input connected
12	to the feedback input, and an output connected to the
13	switch control input.
1	20. A method of controlling welding-type
2	power comprising:
3	providing voltage feedback;
4	integrating the difference between a voltage
5	feedback and a threshold using an integrator with first
6	and second capacitors in a feedback path;
7	comparing eta to a window;
.8	switching the second feedback capacitor in
9	and out of the feedback path in response to comparing
10	ėta.
1	21. A system for welding, comprising:
2	a welding power source having at least one
3	power source control input and a welding power output;
4	a wire feeder connected to the welding power
.5	output and having a wire feed speed input;
6	a feedback circuit, responsive to the welding
7	power output, and having a feedback output; and
8	a controller, having
9	a feedback input connected to the
10	feedback output,
11	a fast-tack detect circuit responsive to
12 15	a trigger signal,
13	a speed control output responsive to the
14	fast-tack detect circuit, and in electrical
15	communication with the wire feed speed input, and

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16	a power source control output responsiv
17	to the fast-tack detect circuit, and in electrica
18	communication with power source control input.
1	22. The system of claim 21 further comprising:
2	a fast-tack control circuit disposed electrically
3	between the fast-tack detect circuit and the power source
4	control output, and disposed electrically between the fast-
5	tack detect circuit and the wire-feed speed output; and
6	a weld control circuit disposed electrically
7	between the fast-tack detect circuit and the power source
8	control output and disposed electrically between the fast-
9	tack detect circuit and the wire-feed speed output.
1	23. The system of claim 21, wherein the power
2	source control output includes a voltage command, including
3	at least one of an open circuit command and a burn back
4	command, and the wire feed speed output includes a ramp to
5	run-in command.
1	24. The system of claim 23, wherein the fast-tac
-2	detect circuit includes a timer circuit responsive to a
3	trigger signal.
1	25. The system of claim 21, further comprising:
2	an inductor winding in electrical communication
3	with the welding power output,
4	an auxiliary winding in magnetic and electrical
5	communication with the inductor winding; and
6	a switch circuit in series with the auxiliary
7	winding;
8	wherein the switch circuit is responsive to the
9	fast-tack detect circuit.
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1	26. A method of welding, comprising:
2	supplying welding power to an arc;
3	feeding wire to the arc;
4	feeding back a signal responsive to the
5	welding power;
6	detecting whether or not the process is a
7	fast-tack process;
8	controlling the supply of power according to
9	a first control scheme if the process is a fast-tack
10	process; and
11	controlling the supply of power according to
12	a second control scheme if the process is not a fast-
13	tack process.
1	27. The method of claim 26 further comprising
2	controlling an open circuit voltage, a burn back voltage,
3	and a ramp to run-in wire feed speed to a first level in the
4	first control scheme and to a different level in the second
5	control scheme.
1	28. The method of claim 27, wherein detecting
2	includes detecting the time between at least two trigger
3	pulls.
1	29. A system for performing a welding
2	process, comprising:
3	power means for providing welding power to an
4	arc;
5	feeder means for feeding wire to the arc;
6	feedback means for feeding back a feedback
7 8	output in response to the welding power provided;
9	detect means for detecting whether or not the
	process is a fast-tack process, connected to a trigger
L 0	input;

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11	speed control means for controlling a speed
12	of the feeder means in response to the detect means, in
13	electrical communication with the feeder means; and
14	power control means for controlling the power
15	means in response to the detect means, in electrical
16 ·	communication with power means.
1	30. The system of claim 29, wherein:
2	the power control means includes means for
3	controlling at least one of an open circuit command and a
4	burn back command; and
5	the speed control means includes means for
6	controlling a ramp to run-in speed command.
1	31. The system of claim 30, wherein the detect
2	means includes means for determining the time between at
3	least two trigger signals.
1.	32. The system of claim 29, further comprising
2	means for reducing an output inductance when the arc is
3	initiating.
1	33. A system for welding, comprising:
2.	means for supplying welding power to an arc;
3	means for feeding wire to the arc;
4	means for feeding back a signal responsive to
5	the welding power, in electrical communication with the
6	means for supplying;
7	means for detecting whether or not the
8	process is a fast-tack process, responsive and
9	connected to a trigger signal;
10	means for controlling the means for supplying
11	according to a first control scheme is the process is a
12	fast-tack process, connected to the means for

13	supplying, and responsive to the means for detecting;
14	and
15	means for controlling the means for supplying
16	according to a second control scheme if the process is
17	not a fast-tack process, connected to the means for
18	supplying, and responsive to the means for detecting.
1	34. The system of claim 33 further comprising
2	means for controlling an open circuit voltage, a burn back
3	voltage, and a ramp to run-in wire feed speed to a first
4	level in the first control scheme and a different level in
5	the second control scheme.
1	35. The system of claim 34, wherein the means for
2	detecting includes means for detecting the time between at
3	least two trigger pulls.
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1	36. A system for welding, comprising:
2	a welding power source having at least one
3	power source control input and a welding power output;
4	a wire feeder connected to the welding output
5	and having a wire feed speed input;
6	a feedback circuit, responsive to the welding
7	power output and a trigger signal, and having a
8	feedback output; and
9	a controller, responsive to the feedback
LO	output, and having
l.1	a first control output connected to the
L2	power source control input and connected to the
L3	wire feed speed input, and
4	a second control output connected to the
.5	power source control input and connected to the
.6	wire feed speed input.

1	37. The system of claim 36, wherein the first
2	control output is a fast-tack control output and the second
3	control output is a welding control output.
1	38. A system for welding comprising:
2	a welding power source having a welding power
3	output;
4	a wire feeder connected to the welding output
5	and having a speed control input; and
6	a controller having a speed control output
7	connected to the speed control input having a weld wire
8	speed set point, and a run-in wire speed set point,
9	wherein the run-in speed set point is a set percentage
LO	of the weld wire speed set point.
1	39. The system of claim 38, wherein the set
2	percentage is a user selectable percentage.
1	40. The system of claim 39, wherein the
2	percentage is between 25 percent and 150 percent.
1	41. The system of claim 39, wherein the system
2	includes a weld wire feed user input, and wherein the
3	controller includes a run-in set circuit including a percent
4	input connected to the user input and an enable input.
1	42. The system of claim 41, wherein the enable
2 ·	input receives a trigger state signal and a power-up signal.
1	43. The system of claim 42 wherein the user input
2	is a potentiometer.
1	44. The system of claim 43, wherein the enable
2	input in connected to a ugor gologiable termine with the

3	45. The system of claim 38 wherein the controller
4	is a microprocessor controller.
1	46. The system of claim 38 wherein the controller
2	is an analog controller.
1	47. A system for welding comprising:
2	power means for supplying welding power to an
. 3	arc;
4	feeder means for feeding wire to the arc; and
5	control means for controlling a speed of the
6	feeder means to a weld speed and a run-in speed,
7	wherein the run-in speed set point is a set percentage
8	of the weld speed set point, connected to the feeder
9	means.
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1 ·	48. The system of claim 47, further comprising
1 · 2	48. The system of claim 47, further comprising means for allowing the user to select the set percentage,
2 3	means for allowing the user to select the set percentage, connected to the control means.
2 3	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising:
2 3 1 2	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc;
2 3 1 2 3	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc;
2 3 1 2 3 4	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc; controlling the speed of the wire during a
2 3 1 2 3 4	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc; controlling the speed of the wire during a run-in state; and
2 3 1 2 3 4 5	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc; controlling the speed of the wire during a run-in state; and controlling the speed of the wire during a
2 3 1 2 3 4 5 6 7	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc; controlling the speed of the wire during a run-in state; and controlling the speed of the wire during a weld state, wherein the run-in speed set is a set
2 3 1 2 3 4 5	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc; controlling the speed of the wire during a run-in state; and controlling the speed of the wire during a
2 3 1 2 3 4 5 6 7 8	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc; controlling the speed of the wire during a run-in state; and controlling the speed of the wire during a weld state, wherein the run-in speed set is a set percentage of the weld speed.
2 3 1 2 3 4 5 6 7 8	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc; controlling the speed of the wire during a run-in state; and controlling the speed of the wire during a weld state, wherein the run-in speed set is a set percentage of the weld speed. 50. The method of claim 49, including using a
2 3 1 2 3 4 5 6 7 8	means for allowing the user to select the set percentage, connected to the control means. 49. A method of welding comprising: providing welding power to an arc; feeding wire to the arc; controlling the speed of the wire during a run-in state; and controlling the speed of the wire during a weld state, wherein the run-in speed set is a set percentage of the weld speed.

1.	51. The method of claim 50, including using the
2	set percentage from the range of between 25 percent and 150
3	percent.
1.	52. The method of claim 51, including determining
2	the user selected percentage speed in response to an enable
3	signal and a weld wire feed user input.
1	53. A welding-type power supply, comprising:
2	a power source;
3	a controller, connected to the power source,
4	and having at least one set point input, and at least
5	one calibration input;
6	a user-selectable input connected to the at
7	least one set point input, and further connected to the
8	at least one calibration input.
1	54. The welding-type power supply of claim 53,
2	further comprising an input-selection circuit, connected to
3	the controller, wherein the controller enables one of the
4	calibration input and set point input, and disables the
5 .	other of the set point input and calibration input.
1.	55. The welding-type power supply of claim 54,
2	further comprising a user-selectable switch connected to the
3.	input-selection circuit.
1	56. The welding-type power supply of claim 55,
2	wherein the user selectable switch is a toggle switch.
L	57. The welding-type power supply of claim 56,
2	wherein the user-selectable input is a potentiometer on a
3	user control panel.

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1	58. The welding-type power supply of claim 54,
2	wherein the controller is a microprocessor controller.
1	59. The welding-type power supply of claim 58,
2	wherein the microprocessor controller includes storage of at
3	least one user-selected calibration value received on the
4	calibration input.
1	60. The welding-type power supply of claim 59,
2	wherein the microprocessor controller includes storage of at
3	least two user-selected calibration values received on the
4	calibration input, and wherein the microprocessor includes a
. 5	scaling circuit that scales at least one of a command output
6	or a feedback output responsive to the at least two user-
7	selected calibration values.
1	61. The welding-type power supply of claim 60,
2	wherein the microprocessor controller includes a digital
3	output disposed to output the at least two user-selected
4	calibration values.
1	62. The welding-type power supply of claim 55,
2	further comprising a calibration pendant, on which the
3	toggle switch is mounted.
1	63. The welding-type power supply of claim 53,
2	wherein the calibration input is an output voltage
3	calibration input.
1	64. The welding-type power supply of claim 53,
2	further comprising:
3	a wire feeder connected to the controller; and
4	a second user selectable input; wherein

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5	one controller includes a wire feed speed
6	and a wife feed speed set point input
. 7	both connected to the second user-selectable input.
1	65. A welding-type power supply, comprising:
2	power means for providing power;
3	input means for receiving user-selectable
4	input; and
5	control means, connected to the input means
6	and the power means, for controlling the power means,
7	and for selectively choosing one of a set point and a
8	calibration value as a value received from the input
9	means.
1	66. The welding-type power supply of claim 65,
. 2	further comprising means for the user to selectively
3	choosing one of the set point and the calibration value as
4	the value received from the input means.
	the result of the riput means.
1	67. The welding-type power supply of alair of
2	elbe bower aubbild of Grarm 62'
3	including means for storing at least one user-selected
	calibration value received on the calibration input.
1	68. A method of calibrating a wolding time
2	68. A method of calibrating a welding-type power supply, of the type having a user-selectable set
3	point input, comprising:
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5	detecting whether or not the power supply is in a calibration mode;
6	\cdot
7	receiving a value from the user-selectable
8	set point input as a calibration value if the power
9	supply is in the calibration mode; and
10	receiving a value from the user-selectable
11	set point input as a set point value if the power
TT	supply is not in the calibration mode.

12	69. The method of claim 68, further comprising
13	receiving a user-selection indicating if the power supply is
14	in the calibration mode.
1	70. The method of claim 68, further comprising

storing the calibration value.

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